(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
1 April 2004 (01.04.2004)

PCT

(10) International Publication Number
WO 2004/027076 A2

(51) International Patent Classification[7]: C12P

(21) International Application Number:
PCT/US2003/029464

(22) International Filing Date:
22 September 2003 (22.09.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/412,719 23 September 2002 (23.09.2002) US

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declaration under Rule 4.17:**
— *of inventorship (Rule 4.17(iv)) for US only*

**Published:**
— *without international search report and to be republished upon receipt of that report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

WO 2004/027076 A2

(54) Title: BIOCONVERSION OF XYLAN AND LEVULINIC ACID TO BIODEGRADABLE THERMOPLASTICS

(57) Abstract: Biodegradable polyesters are produced by microbial fermentation using xylose and levulinic acid as carbon sources.

management problems, and continued global pollution. Another marketable advantage of these biopolymers is their production from renewable resources used as the primary carbon source and co-substrate. Production based on relatively inexpensive substrates could make PHA-derived thermoplastics more economically competitive with petroleum-based plastics, as the major costs in PHA production are the substrate and the separation process (Byrom 1987). Ramsay *et al.* (1995) demonstrated the ability of *Pseudomonas pseudoflava* to produce poly-β-hydroxyalkanoates using the major sugars present in hemicellulose as sole carbon sources. Naylor et al., U.S. 5,871,980, disclose production of PHA by fermentation of *Alcaligenes sp.* by feeding the cells an aliphatic acid typically containing one or more alkyl groups containing 8-25 carbon atoms. Naylor et al. demonstrate that optional addition of an odd-number carbon molecule, e.g., propionic acid or n-propyl alcohol, can result in the production of PHAs containing up to 30 mol% valerate.

Levulinic acid is a 4-keto-pentanoic acid obtainable via acid hydrolysis of 6-carbon sugars, which can be derived from carbohydrate-containing renewable wastestream residues (Bozell *et al.* 2000). Co-polymers of P(3HB-co-3HV) have been produced microbially (*Alcaligenes sp.* SH-69) from glucose and levulinic acid, with this organic acid co-substrate displaying a significant stimulatory effect on both cell growth and co-polymer accumulation (Jang and Rogers 1996). Jang and Rogers (1996) report that levulinic acid is an inexpensive substrate that compares favorably with propionic, valeric, or pentanoic acids as a co-substrate for PHA production. Steinbuchel *et al.* (1998) describe the production and characterization of polyesters containing 4-hydroxyvaleric acid and medium-chain length hydroxyalkanoic acids from octanoic acid as a principal carbon source and levulinic acid as a co-substrate.